UNIVERSITY OF HAWAI'I LIBRARY

Harvard St. John

Rhodora

JOURNAL OF THE

NEW ENGLAND BOTANICAL CLUB

Conducted and published for the Club, by

REED CLARK ROLLINS, Editor-in-Chief

ALBERT FREDERICK HILL
STUART KIMBALL HARRIS
RALPH CARLETON BEAN
RICHARD ALDEN HOWARD
CARROLL EMORY WOOD, JR.
} Associate Editors

Vol. 56 **May, 1954** **No. 665**

CONTENTS

Some Floristic Relationships between Mexico and the United States. *Robert L. Dressler*..... 81
A History of Tillaea aquatica (Crassulaceae) in Canada and Alaska. *W. J. Cody*..... 96
The Club Herbarium Gets a New Home. *R. C. Rollins*..... 101
Some New Names in South American Gentiana. *Robert C. Foster* 103
Recently Introduced Plants in Southern Ontario. *J. K. Shields* 103
A Popular Flora of Central Colorado [Review]. *S. F. Blake*.. 103

The New England Botanical Club, Inc.

8 and 10 West King St., Lancaster, Pa.

Botanical Museum, Oxford St., Cambridge 38, Mass.

QK
1
R47

RHODORA.—A monthly journal of botany, devoted primarily to the flora of the Gray's Manual Range and regions floristically related. Price, $4.00 per year, net, postpaid, in funds payable at par in United States currency in Boston; single copies (if available) of not more than 24 pages and with 1 plate, 40 cents, numbers of more than 24 pages or with more than 1 plate mostly at higher prices (see 3rd cover-page). Back volumes can be supplied at $4.00. Some single numbers from these volumes can be supplied only at advanced prices (see 3rd cover-page). Somewhat reduced rates for complete sets can be obtained on application to Dr. Hill. Notes and short scientific papers, relating directly or indirectly to the plants of North America, will be considered for publication to the extent that the limited space of the journal permits. Illustrations can be used only if the cost of engraver's blocks is met through the author or his institution. Forms may be closed five weeks in advance of publication. Authors (of more than two pages of print) will receive 15 copies of the issue in which their contributions appear, if they request them when returning proof. Extracted reprints, if ordered in advance, will be furnished at cost.

Address manuscripts and proofs to Reed C. Rollins,
Gray Herbarium, 22 Divinity Ave., Cambridge 38, Mass.

Subscriptions (making *all remittances* payable to RHODORA) to
Dr. A. F. Hill, 8 W. King St., Lancaster, Pa., or, preferably, Botanical Museum, Oxford St., Cambridge 38, Mass.

Entered as second-class matter March 9, 1929, at the post office at Lancaster, Pa., under the Act of March 3, 1879.

INTELLIGENCER PRINTING COMPANY
Specialists in Scientific and Technical Publications
EIGHT WEST KING ST., LANCASTER, PA.

CARD-INDEX OF NEW GENERA, SPECIES AND VARIETIES OF AMERICAN PLANTS

For all students of American Plants the Gray Herbarium Card-index of Botanical Names is indispensable. It is a work of reference essential to scientific libraries and academies and all centers of botanical activity. It includes genera and species from 1885 to date. The subdivisions of species from 1885 to date are now included and from 1753 to 1886 are in the process of being inserted. Issued quarterly, at $25.50 per thousand cards.

GRAY HERBARIUM of Harvard University,
Cambridge 38, Mass., U. S. A.

Rhodora

JOURNAL OF

THE NEW ENGLAND BOTANICAL CLUB

Vol. 56 May, 1954 No. 665

SOME FLORISTIC RELATIONSHIPS BETWEEN MEXICO AND THE UNITED STATES

Robert L. Dressler

Mexico has long been recognized as a biological cross-roads between the Americas and as a biotic peninsula in relation to the rest of the continent. It is becoming apparent that the biogeography of North America cannot be properly studied without giving a great deal of attention to its southern extensions and relationships. The floristic similarities between Mexico and the United States, particularly in their eastern regions, were noted by Watson (1891), and this relationship has, in recent years, received notice somewhat proportionate to its biogeographic interest, particularly through Sharp and his collaborators.

Various and somewhat conflicting interpretations have been offered for these floristic relationships. The present, imperfect state of knowledge concerning the eastern Mexican-eastern United States pattern of distribution has been adequately dealt with by Sharp and others (Miranda and Sharp, 1950, Sharp, 1946, 1951). In the present paper, an attempt will be made to review the floristic evidence and to consider in some detail its possible interpretations.

Floristic Relationships

This discussion will largely be limited to the spermatophytes, as these are best known geographically and paleobotanically. Miranda and Sharp (1950) list a number of ferns which occur in eastern Mexico and the eastern United States, as well as some mosses and fungi (see also Sharp, 1948) which show a similar

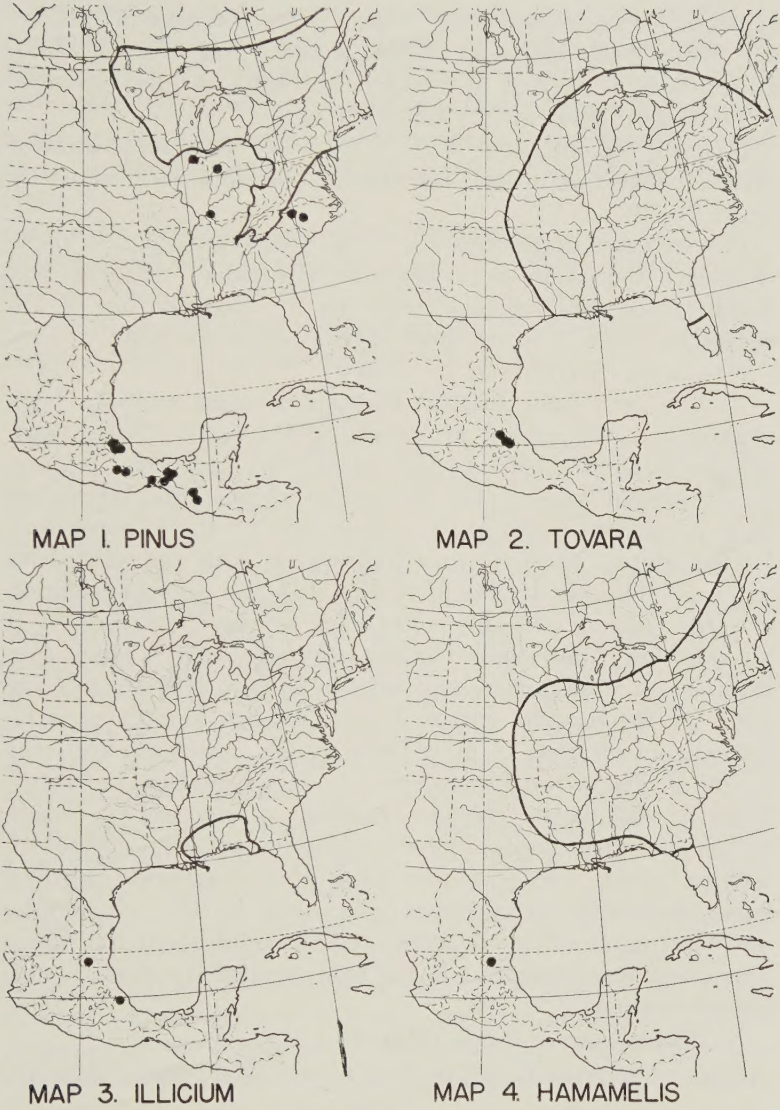
pattern. The characteristic distribution pattern with which this paper is especially concerned is that shown in maps 1 to 6. A number of species that are relatively widespread in the eastern United States occur also on the escarpments of the mountains of eastern and southern Mexico and of Guatemala. Many, if not most, of these plants have disjunct ranges, being absent from southern Texas and northern Mexico and frequently discontinuous in Mexico. Since lists of the species with ranges of this type have been published elsewhere, the present discussion will be limited to species of special interest and a few which have not been listed in the papers cited (Hernández, et al. 1951; Miranda, 1945; Miranda & Sharp, 1950; Sharp, 1946–1952; Steyermark, 1950).

TAXUS GLOBOSA Schlecht.: This species is known from the Mexican states of Veracruz, Hidalgo, Mexico and Oaxaca. Its relationships among the more northern species are uncertain, but it seems to resemble most closely *T. floridana* Nutt., of west Florida.

PINUS STROBUS L. & var. CHIAPENSIS Martínez: (Map 1). This species provides one of the most striking distributions of this type. *Pinus Strobus*, which is so generally considered a northern type, has, in recent years, been found to be fairly abundant in the Mexican states of Chiapas, Oaxaca and Puebla and in Guatemala (Martínez, 1945; Sharp, 1946).

PANICUM VILLOSISSIMUM Nash: This grass is widespread in the eastern United States and occurs in Nuevo León, Mexico, but is apparently absent between that station and Guatemala, where other collections of this species have been made (Steyermark, 1950).

EPIDENDRUM CONOPSEUM R. Br. & var. MEXICANUM L. O. Wms.: The orchids, with their tiny, wind-blown seeds, are perhaps poor material for phytogeographic study; this species, however, is exceptional among the epiphytic species in its distribution. Other epiphytes of the United States are limited to Florida and are either West Indian or very widespread species. *E. conopseum* is absent from southern Florida and occurs in Alabama and Louisiana and north to southern North Carolina. Its Mexican occurrence, in Morelos, is somewhat west of the usual area for such disjunctions, but the pattern is otherwise



MAP 1. *Pinus Strobus*. Data from Martínez (1945), Munns (1938) and Sharp (1946). MAP 2. *Tovara virginiana*. Data from Li (1952) and Sharp (1952). MAP 3. *Illicium floridanum* (including *I. mexicanum*). Data from Hernández, et al (1951) and Smith (1947). MAP 4. *Hamamelis virginiana*. Data from Hernández, et al (1951) and Munns (1938).

typical. Its associates in the United States, *Magnolia*, *Liquidambar*, *Fagus*, *Carpinus*, *Acer*, *Taxodium* and *Nyssa* (Correll, 1950), are all trees of typical Mexico-United States disjunct pattern.

Tovara virginiana (L.) Raf. (Map 2).

Illicium floridanum Ellis: (Map 3) The southernmost Mexican collection, from Veracruz, was named *I. mexicanum* by Smith (1947).

Liquidambar styraciflua L.: This tree is abundant in parts of Mexico and occurs as far south as Nicaragua. Miranda and Sharp (1950) consider its distribution to represent that of the vegetation types in which most of these disjuncts occur.

Hamamelis virginiana L. (Map 4).

Prunus serotina Ehrh.: This species has recently been studied and mapped by McVaugh (1951, 1952). Three taxa, subspecies *serotina*, *hirsuta* and *eximia*, are of special interest to the present paper. The subspecies *hirsuta* (Ell.) McVaugh is a primitive, conservative population of the southeastern United States, which is now hybridizing with the subspecies *serotina*. Though McVaugh thinks that the original isolation of subsp. *hirsuta* probably dates back to the Cretaceous, it is possible that it dates only to the early Pleistocene. The subsp. *serotina* is a wide-ranging and more aggressive type occurring in much of the eastern United States, Mexico and Guatemala. McVaugh feels that it may have spread northward into the United States in the Pleistocene. It shows evidences of introgression from subsp. *hirsuta* in much of its range. Subsp. *eximia*, of central Texas, appears to be a recent offshoot of subsp. *serotina* which was separated from that population without being affected by introgression from subsp. *hirsuta*. It may be that the migrations of the Pleistocene brought about hybridization which was important in the formation of the modern subspecies *serotina*.

Nyssa sylvatica Marsh (Map 5).

Cornus florida L. & var. Urbiniana (Rose) Wang (Map 6).

Similar Faunistic Relationships

It might be expected that some animal species or genera would show similar patterns, but relatively few examples are available. Epling (Dobzhansky & Epling, 1944) has attempted

to correlate the occurrence of a chromosome inversion phylad of *Drosophila pseudoobscura* in Mexico and Guatemala with the distribution of the Arcto-Tertiary forest species which occur in this region. However, this species of *Drosophila* is not present in the eastern United States, and its range in the western United States is scarcely to be correlated with the Arcto-Tertiary forest type.

Schmidt (1946) has noted the relationships between Central America and eastern North America in their herpetological faunas. In a general way this relationship parallels the floristic pattern, but it is largely on the generic rather than the species level, and it may well be an older pattern.

The Pattern of Distribution

Our knowledge of the east Mexican flora seems too inadequate to warrant an attempt at mathematical treatment of the types of distribution and plants involved. It is clear, however, that many plants are distributed in the way indicated and that many of the ranges are disjunct. It is interesting to compare these disjunctions with those involving southeastern United States and eastern Asia, since a number of the same genera are involved in both relationships (Gray, 1859; Li, 1952). The most striking difference is that the Mexican plants, unlike the Asiatic ones, are frequently the same species as those in the United States. In some cases varieties have been recognized and sometimes questionable species, but many are clearly the same species in both areas. While many of the Mexican disjuncts are trees, a number are herbaceous plants, including at least one grass. The herbaceous flora is probably less strictly bound by vegetational limits and therefore less likely to be disjunct. In addition, the herbs are less well known, because nothing comparable to Standley's *Trees and Shrubs of Mexico* is available to aid in their study. It appears, however, that the peculiar herbaceous endemics of the southeastern United States and of that area and Asia (such as the several Berberidaceous herbs listed by Li, 1952) are absent from Mexico. This may be due to the generally tropical nature of the undergrowth, even where the dominants are temperate species (Miranda & Sharp, 1950; Leopold, 1950). This feature would also reduce the probability of faunistic parallels.

The areas south of the United States where the greatest number of these plants occur are between Zacualtipán, Hidalgo and Jalapa, Veracruz, about the Mesa de San Cristóbal, Chiapas and in the mountains of Guatemala. In all these areas the plants occur most frequently on mountain escarpments, where locally temperate climate with adequate rainfall may be found. That rainfall is probably the most critical factor in accounting for the present disjunction of these species is seen by referring to the vegetation and rainfall maps for this area (Maps 7 & 8). These plants are largely coincident with the more mesic forest types. These forests, in the region of discontinuity, correspond roughly with the areas receiving over forty inches of rainfall annually. Farther south a higher rainfall figure, 50 or 60 inches, corresponds more closely to the vegetational pattern.

An interesting parallel to this distribution pattern is to be found in southeastern Asia, where Li (1952, p. 402) notes of these temperate genera: "Some genera also extend into the tropical regions of Asia, to Malaysia, . . . But in these warmer regions they represent only rare relic elements, inhabiting mostly the mountain regions." The faunistic relationships are also generally parallel in the two areas (Schmidt, 1946).

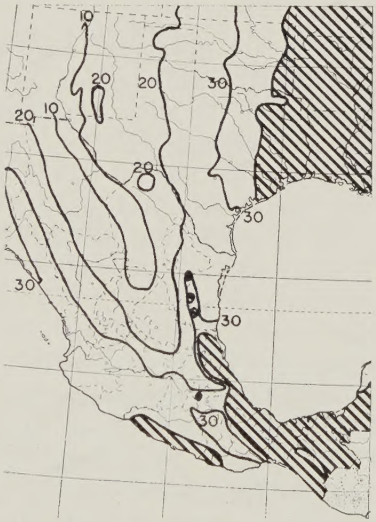
Other Extra-tropical Relationships of the Mexican Flora

Miranda and Sharp (1950) point out several plants of the eastern escarpment which seem to be conspecific with, or closely related to, West Indian species; these may represent a dissected circum-Caribbean pattern of distribution. The other floristic element of the east Mexican flora which must be considered here is that which it shares with the western United States and northwestern Mexico. Miranda and Sharp (1950) observe that the floristic dissimilarity between eastern and western United States seems to extend into Mexico but with diminished intensity. However, as they note, a west-American element is conspicuous in eastern Mexico. Muller (1947) draws attention to the close relationships between the chaparral vegetation of northeastern Mexico and that of California. The two-fold relationship between the Mexican and the United States floras extends south into Guatemala, where Steyermark (1950) notes,

MAP 5. NYSSA

MAP 6. CORNUS

MAP 7. FORESTS



MAP 8. RAINFALL

Map 5. *Nyssa sylvatica.* Data from Miranda (1945) and Munns (1938). Map 6. *Cornus florida.* Data from Munns (1938) and Rickett (1950). Map 7. Forest distribution in Texas and eastern Mexico. Diagonal lines represent mesophytic forest types, while the stippled area represents xerophytic forest types. Adapted from Braun (1950), Leopold (1950) and Tharp (1939). Map 8. Annual rainfall distribution in Texas and eastern Mexico. Diagonal lines represent areas receiving 40 inches or more of rainfall annually. Adapted from Brooks, et al (1936), Shreve (1944) and U.S.D.A. Yearbook, 1941.

in addition to the eastern types, a strong element with its affinities in the Rocky Mountain area, including such genera as *Calochortus, Zygadenus, Montia, Gaura* and *Penstemon.* The elements involved in this relationship are Madro-Tertiary or Cordilleran (Axelrod, 1939) rather than Arcto-Tertiary as are the eastern disjuncts. The noteworthy feature of the western relationships is that the Mexican and Guatemalan plants are rather consistently different species than those of the western United States, a fact which may be of some value in interpreting these relationships.

Historical Interpretation

Before attempting to present a coherent explanation of these relationships, it seems most convenient to review and discuss briefly the various explanations which have been offered.

Epling (Dobzhansky & Epling, 1944), in his discussion of *Drosophila,* attempts to correlate the distribution of a *Drosophila* phylad with that of the Arcto-Tertiary forest, and thus with many of the plant disjuncts considered here. His interpretation of past forest distributions is perhaps the earliest to give much attention to the Mexican-Guatemalan outliers of northern types, and is in keeping with previous vague suggestions implying an early Tertiary age for this floristic relationship. He concludes that the present distribution of *Drosophila* must have arisen either in the pluvial periods of the Pleistocene or in the early Tertiary and strongly favors the latter on paleobotanical and paleoclimatic grounds. His conclusions concerning *Drosophila* have proven controversial and have been discussed at length elsewhere (Mayr, et al. 1945). In any case, the disjunction in *Drosophila* does not parallel that in the forest species with which it is associated in southern Mexico and Guatemala.

Steyermark (1950) notes the two-fold floristic relationship between Guatemala and the United States and considers the relationship with eastern North America to be the more ancient. Following concepts developed by Fernald (1931) and Braun (1947, 1950), he notes that the area occupied by these types in Guatemala includes the oldest land surfaces in the country and that these same plants occupy the Ozarkian and Appalachian plateaus, also old land surfaces. Steyermark concludes that

these northern plants occupied both the Appalachian region and the Guatemalan highlands in the early Tertiary when these areas were reduced to low-lying peneplains. He observes that many of these plants occur in the North American Coastal Plain flora, but does not explain the failure of these species to migrate to younger land surfaces in Central America. It would appear that the occurrence of these plants in the latitude of Guatemala is dependent upon the effects of altitude; if this be the case, they could not have existed there when the area was peneplained. The relationships between Guatemala and western North America seem, on the basis of geological and floristic evidence, to be older than the eastern relationships. Steyermark's explanation of the floristic differences between eastern and western North America as being due to the Cretaceous seas seems equally doubtful in view of the evidence from paleobotany that these differences have largely been of more recent origin.

McVaugh (1952) thinks it probable that many of these temperate types may have persisted in Mexico and Central America since the early Tertiary or even the Cretaceous, and stresses the occurrence of temperate and tropical types in the same area at different altitudes. It is the dependence of these temperate types on higher altitudes which weakens the argument. It seems improbable that these temperate types could have persisted in Mexico in the early Tertiary when the climatic-vegetational zones were much farther north than now and mountain ranges were poorly developed. While I do not doubt the ultimately tropical origins of many groups, those populations which are conspecific in Central America and temperate North America would seem to have had, as suggested by Miranda and Sharp (1950), "a northern evolution and relationship", at least during the Tertiary. McVaugh's plea for a consideration of the whole of North America in botanical studies is laudable, and the phylogenetic pattern which he offers is probably quite applicable to many plants, especially the more modern herbs, such as *Lobelia* and *Salvia*.

Gentry (1946, p. 461), in describing a similar but less striking mixture of tropical and temperate types in western Mexico, states: "Most of such distributions appear to be relics repre-

senting Pleistocene adventives established during glacial epochs, when the cold front was farther south." This is an explanation which must be given due consideration, and, as will be shown, there is considerable evidence in its favor.

Deevey (1949), though not directly concerned with the present problem, stresses the importance of the Pleistocene in shaping modern ranges and suggests that temperate species were "pushed south of the Rio Grande" during parts of the Pleistocene. While it seems, as Deevey admits, that "southeastern North America taken as a whole may have served as a refuge," great distributional changes must have taken place during the Pleistocene, and these changes are probably directly related to the present problem. Deevey stresses the necessity of studying Mexico and other non-glaciated areas to a proper understanding of the Pleistocene.

Sharp (1951) draws attention to the close generic parallels between the Eocene Wilcox flora and the modern flora of the Mexican eastern escarpments. More genera (68%) of the Wilcox flora are represented in eastern Mexico than in any other area. It is noted that there are a few more temperate types represented in the Wilcox strata than Berry (1937) had thought. Sharp feels that, barring extensive parallel changes in ecological requirements, such a mixture of "temperate" and "tropical" types demands either transport from the uplands or greater ecological amplitude for many genera in the early Tertiary, and favors the latter explanation. Brown (1946), however, implies that long distance transport may have been involved in the case of some of these temperate types. There remains the possibility that a lessening of the climatic extremes might allow such a seemingly incongruous mixture of floristic types (Axelrod, 1948). Many of the east Mexican disjuncts probably occurred in Eocene time further north than the Wilcox area, and perhaps at higher altitudes.

In a more recent paper, (1953), Sharp reviews the floristic relationships between Mexico and other parts of the world and points out the fact that the physiographic history of Mexico seems to indicate a relatively recent invasion from the north for temperate types.

Geological and Paleobotanical Evidence

If, as appears to be the case, the presence of most "temperate" species in tropical latitudes is dependent upon high altitude habitats, then the physiographic history of southern North America is a critical part of the evidence. The material for the following summary was largely obtained from Garfias and Chapin (1949). While some mountain building occurred at about the close of the Cretaceous, the effects of this orogeny were largely nullified by early Tertiary peneplanation, this apparently culminating in the low relief of the Oligocene. Thus, for our purposes, the history of the present Mexican mountains may begin in the Miocene. The Sierra Madre Occidental arose at this time and the Sierra Madre del Sur also underwent some uplift, so that a mountain chain traversing western North America was available from the Miocene onward. The physiographic ties binding Mexico and Central America to the western United States seem to have been stronger than those connecting to the eastern United States, at least in the Cretaceous and earlier Tertiary. The western mountains, however, are not involved in the distribution of the majority of the temperate, Arcto-Tertiary disjuncts. The Sierra Madre Oriental, the critical link in these distributions, was not uplifted until the Pliocene. Since its uplift, the northern part of this mountain range has undergone considerable erosion, reaching a mature stage, with the mountains now somewhat discontinuous in the north. This would point to the late Pliocene or earlier Pleistocene as the time most favorable, physiographically, for the development of the ranges with which we are here concerned. The Sierra Madre del Sur was further uplifted in the Pliocene and the Sierra de Chiapas and related mountains of Guatemala were greatly uplifted in the late Pliocene.

The paleobotanical evidence is almost non-existent for critical areas, but gives climatic and floristic evidence for other areas, which can be correlated with the physiographic evidence to give a tentative interpretation. As previously stated, it seems improbable that a significant number of temperate plants could have persisted in Mexico during the Eocene or Oligocene. The first montane connections with temperate North America, in the Miocene, were with the western United States. The relative

absence of Arcto-Tertiary types from western Mexico argues that the area of the xeric Madro-Tertiary flora in northwestern Mexico was an effective barrier to the Arcto-Tertiary types or that climatic conditions were not then such as to push them that far south. The prairie vegetation was already developing in the central United States (Chaney & Elias, 1936; Elias, 1942) at this time, and North America was being effectively divided into eastern and western floristic areas. The movement of Cordilleran and Madro-Tertiary elements southward toward Guatemala was probably underway at this time.

During the Pliocene physiographic connections between the eastern United States and Mexico developed, but the middle Pliocene, at least, appears to have been a period of aridity (Axelrod, 1948), scarcely the proper setting for the southward extension of mesophytic plants. This was probably the time of the maximum extension of Madro-Tertiary plants, including the western types in northeastern Mexico (Miranda & Sharp, 1950, Muller, 1947), in Guatemala (Steyermark, 1950) and in the southeastern United States (McVaugh, 1943). Again, paleobotanical data for the critical areas are few, but the Clarendon florule from northern Texas exhibits Madro-Tertiary species of an aspect more xeric than that of the floras farther north (Axelrod, 1948; Chaney & Elias, 1936).

It is in the Pleistocene that the proper climatic and physiographic conditions for a floristic exchange between eastern Mexico and the eastern United States seem to be met. It is difficult to localize these contacts in the Pleistocene. The physiographic evidence points to but does not require an earlier Pleistocene time. The latest that this vegetation could have been continuous would be before the xerothermic period (if it was felt, as such, in that region), though the disjunction may have arisen at an earlier time. Evidence from pollen analysis indicates that east Texas had a cooler and more mesic climate in the past (Potzger & Tharp, 1947) and shows a long period of climatic fluctuation for Mexico (Sears & Clisby, 1952). If the Pleistocene was felt by marked pluvial periods in the southwest, the relative absence of mesic disjuncts in western Mexico is probably to be explained by the Pliocene modernization of the western United States (Axelrod, 1948). Few mesic

plants were available in the western United States by Pleistocene time.

The floristic data support the interpretation here given in that many of the most striking eastern disjuncts have not developed into separate species, while the Mexican and Guatemalan plants with relatives in the western United States are usually distinct species. Evidence of this nature cannot be precise, but its general utility has been pointed out by Fernald (1931) and Li (1952). Particularly interesting are *Carya*, *Magnolia*, *Hamamelis*, *Liquidambar*, *Cercis*, *Parthenocissus*, *Nyssa* and *Mitchella*. All of these genera have distinct species in eastern Asia and the southeastern United States, but the Mexican and Guatemalan plants are, in each case, conspecific with those of the United States. Schmidt's zoogeographic paper (1946) deserves mention, and the chart on page 151, though not directly applicable to this problem, deserves the attention of phytogeographers. The faunistic evidence generally parallels that available from plant geography.

The main vegetational continuity in the east probably occurred not through the most direct route now available but through the Big Bend region, being determined by physiography. The present xeric forest types are nearly continuous along this route (see Map 7). This area is also of interest in that it has been suggested as the path along which an aboriginal culture pattern including agriculture with maize, beans and perhaps squash entered the United States (Thone, 1935). More data from pollen analysis is greatly to be desired from this region.

Summary

The importance of Mexico to North American biogeography is noted and the two-fold relationship between Mexico and the eastern and western United States is discussed. Some species involved in the Guatemala and eastern Mexico-southeastern United States pattern of distribution are discussed and a few are mapped. The physiographic and paleobotanical evidence is reviewed and it is concluded that temperate types may have migrated southward in western North America as early as the Miocene. The western temperate groups in Guatemala may well have arrived there, as Steyermark suggests, in the Pliocene.

The eastern North American plants, on the other hand, probably did not migrate southward into Mexico and Guatemala until the early Pleistocene. These eastern species have since become disjunct because of decreased rainfall in Texas and northeastern Mexico.

Bibliography

Axelrod, Daniel I. 1939. A Miocene flora from the western border of the Mohave Desert. Carn. Inst. Wash. Pub. **516**: 1–129.

————. 1948. Climate and evolution in western North America during middle Pliocene time. Evolution **2**: 127–144.

Berry, E. W. 1937. Tertiary floras of eastern North America. Bot. Rev. **3**: 31–46.

Braun, E. Lucy. 1947. Development of the deciduous forests of eastern North America. Ecol. Monogr. **17**: 211–219.

————. 1950. Deciduous Forests of Eastern North America, 596 pp.

Brooks, Charles F., A. J. Connor & Others. 1936. Climatic Maps of North America. Harvard Univ. Press.

Brown, Roland W. 1944. Temperate species in the Eocene flora of the southeastern United States. Journ. Wash. Acad. Sci. **34**: 349–351.

Chaney, Ralph W. 1936. The succession and distribution of Cenozoic floras around the northern Pacific Basin. *in* Essays in Geobotany in Honor of William Albert Setchell (T. H. Goodspeed, ed.), pp. 55–85.

————. 1940. Tertiary forests and continental history. Bull. Geol. Soc. Amer. **51**: 469–488.

————. 1947. Tertiary centers and migration routes. Ecol. Mongr. **17**: 139–148.

———— & M. K. Elias. 1936. Late Tertiary floras from the High Plains. Carn. Inst. Wash. Pub. **476**: 1–46.

Correll, Donovan S. 1950. Native Orchids of North America North of Mexico, 399 pp.

Deevey, Edward S., Jr. 1949. Biogeography of the Pleistocene. Bull. Geol. Soc. Amer. **60**: 1315–1416.

Dobzhansky, T. & C. Epling. 1944. Contributions to the genetics, taxonomy and ecology of *Drosophila pseudoobscura* and its relatives. Carn. Inst. Wash. Pub. **554**: 1–183.

Elias, Maxim K. 1942. Tertiary prairie grasses and other herbs from the High Plains. Geol. Soc. Amer. Spec. Paper **41**: 1–176.

Fernald, M. L. 1931. Specific segregations and identities in some floras of eastern North America and the Old World. Rhodora **33**: 25–63.

Garfías, V. R. & T. C. Chapin. 1949. Geología de México, 202 pp., Editorial Jus, México, D. F.

Gentry, Howard S. 1946. Notes on the vegetation of Sierra Surotato in northern Sinaloa. Bull. Torr. Bot. Club **73**: 451–462.

Gray, Asa. 1859. Diagnostic characters of new species of phaenogamous plants, collected in Japan by Charles Wright, Botanist of the U. S. North Pacific Exploring Expedition. With observations upon the relations of the Japanese flora to that of North America, and of other parts of the northern temperate zone. Mem. Am. Acad. Arts & Sci. n.s. **6**: 377–449.

Hernández X., E. H. Crum, W. B. Fox & A. J. Sharp. 1951. A unique vegetational area in Tamaulipas. Bull. Torr. Bot. Club **78**: 458–463.

Leopold, A. S. 1950. Vegetation zones of Mexico. Ecology **31**: 507–518.
Li, Hui-Lin. 1952. Floristic relationships between eastern Asia and eastern North America. Trans. Amer. Phil. Soc. n.s. **42**: 371–429.
McVaugh, Rogers. 1943. The vegetation of the granitic flat-rocks of the southeastern United States. Ecol. Monogr. **13**: 119–166.
——— ———. 1951. A revision of the North American black cherries (*Prunus serotina* Ehrh., and relatives). Brittonia **7**: 279–315.
———. 1952. Suggested phylogeny of *Prunus serotina* and other wide-ranging phylads in North America. Brittonia **7**: 317–346.
Martínez, M. 1945. Las Pinaceas mexicanas, vol. 1. An. Inst. Biol. Mex. **16**: 1–352.
Mayr, E., G. L. Stebbins, Jr. & G. G. Simpson. 1945. Symposium on age of the distribution pattern of the gene arrangements in *Drosophila pseudoobscura*. Lloydia **8**: 69–108.
Miranda, F. 1944. El género *Nyssa* en México. An. Inst. Biol. Mex. **15**: 369–374.
———. & A. J. Sharp. 1950. Characteristics of the vegetation in certain temperate regions of eastern Mexico. Ecology **31**: 313–333.
Muller, C. H. 1947. Vegetation and climate of Coahuila, Mexico. Madroño **9**: 33–57.
Munns, E. N. 1938. The distribution of important forest trees of the United States. U. S. Dept. Agric., Misc. Pub. 287.
Potzger, J. E. & B. C. Tharp. 1947. Pollen profiles from a Texas bog. Ecology **28**: 274–280.
Rickett, H. W. 1950. *Cornus* in Mexico, with notes on the evolution of the genus. An. Inst. Biol. Mex. **21**: 83–94.
Schmidt, K. P. 1946. On the zoogeography of the Holarctic region. Copeia **1946**: 144–152.
Sears, P. B. 1932. Postglacial climate in eastern North America. Ecology **13**: 1–6.
———. 1942. Xerothermic theory. Bot. Rev. **8**: 708–736.
——— & K. H. Clisby. 1952. Two long climatic records. Science **116**: 176–178.
Sharp, A. J. 1946. *Pinus Strobus* south of the United States. Journ. Elisha Mitchell Sci. Soc. **62**: 229–230.
———. 1948. Some Fungi common to the highlands of Mexico and Guatemala and eastern United States. Mycologia **40**: 499–502.
———. 1950. A new variety of *Ilex vomitoria* from southern Mexico. Bot. Mus. Leafl. Harv. Univ. **14**: 107–108.
———. 1951. The relation of the Eocene Wilcox Flora to some modern floras. Evolution **5**: 1–5.
———. 1952. *Tovara* in Mexico. Rhodora **54**: 305–306.
———. 1953. Notes on the flora of Mexico: World distribution of the woody dicotyledonous families and the origin of the modern vegetation. Journ. Ecology **41**: 374–380.
Shreve, F. 1944. Rainfall of northern Mexico. Ecology **25**: 105–111.
Smith, A. C. 1947. The families Illiciaceae and Schisandraceae. Sargentia **7**: 1–244.
Standley, P. C. 1920–1926. Trees and Shrubs of Mexico. Contr. U. S. Nat. Herb. **23**: 1–1721.
——— & J. A. Steyermark. 1946–. Flora of Guatemala. Fieldiana: Botany 24, Parts 3–6 published.

Steyermark, J. A. 1950. Flora of Guatemala. Ecology **31**: 368–372.
Tharp, B. C. 1939. The vegetation of Texas. Texas Acad. Pub. Nat. Hist., non-technical ser. **1**: 1–74.
Thone, F. 1935. A corridor for corn. Sci. News Letter **27**: 419.
United States Dept. of Agriculture. 1941. Climate and Man. U.S.D.A. Yearbook, 1248 pp.
Watson, S. 1891. The relation of the Mexican flora to that of the United States. Proc. Amer. Assoc. Adv. Sci. **39**: 291–292.
Williams, L. O. 1951. The Orchidaceae of Mexico. Ceiba **2**: 1–321.

A HISTORY OF TILLAEA AQUATICA (CRASSULACEAE) IN CANADA AND ALASKA[1]

W. J. Cody

Tillaea aquatica L. (*T. simplex* Nutt.; *T. Vaillantii* sensu Gray's Manual, ed. 7, 1908, not Willd.; *Tillaeastrum aquaticum* (L.) Britt.) has been but little collected in Canada, both because of its small stature and its apparently restricted habitat. A collection from Yellowknife in Mackenzie District, N.W.T., suggested the following study.

Tillaea aquatica in Canada was apparently unknown to John Macoun as late as 1886, for there is no mention of it in his Catalogue of Canadian Plants, Part 1, 1883, or in the Additions and Corrections published in 1886.

There is a specimen in the Herbarium of the National Museum of Canada collected by Professor Macoun on August 4, 1887 from a salt marsh, Alberni Canal, Vancouver Island, British Columbia, which is apparently the first collection for Canada, but it was at first misnamed *Elatine americana*. It was not on the basis of this specimen that it was reported as new to the flora of Canada, for in the Canadian Record of Science, January 1895, the following record by J. M. Macoun appears: "*Tillaea simplex* Nutt. In mud in mill pond at Mount Stewart, Prince Edward Island 1888 (John Macoun). New to Canada." (August 17, 1888 [John] Macoun (CAN)). Other records from Prince Edward Island are those of J. R. Churchill—the fifth collection of the species in Canada—(Tracadie Beach, *J. R. Churchill* August 1, 1901 (CAN)), and Fernald and St. John (wet brackish sand, Tracadie, *Fernald & St. John 11071*, August 22, 1914 (MT)).

[1] Contribution No. 1340 from the Botany and Plant Pathology Division, Science Service, Department of Agriculture, Ottawa, Canada.

Churchill,[2] has the following discussion of the species: "The second native and notable plant was a *Tillaea*, which I found in the wet sandy margin of Campbell's Pond, which is separated from the ocean by the same broad beach at Tracadie. Though the station was far north of its known range, it was of course assumed to be *Tillaea simplex*, and it was only after careful examination since my return, that Mr. Fernald identified it with *T. Vaillantii*, Willd., of Africa and Central Europe. The little plant, less than an inch high, grows in moss-like tufts like its congener *T. aquatica*, L. (*T. simplex*, Nutt.) from which it differs principally in the elongated pedicels of some of the flowers. This species has not been reported from North America; but the '*Tillaea simplex*' mentioned in Mr. J. M. Macoun's Contributions to Canadian Botany as "new to Canada," and collected also on Prince Edward Island, may be '*T. Vaillantii*'."

In Contributions to Canadian Botany XVI by J.M. Macoun,[3] John Macoun's collection from Mount Stewart was referred to *T. vaillantii*, but later[4] that author published the following note:

"*Tillaeastrum aquaticum* (L.) Britton.
Centunculus minimus Cat. Can. Plants vol. II p. 340 in part.
Tillaea simplex Contr. Can. Bot. Pt. V.
T. vaillantii Contr. Can. Bot. Pt. XVI in part.
"Our specimens are from Mount Stewart, Prince Edward Island, No. 8,705; Beauport, near Quebec, Que., No. 68,640; Kamloops, B.C., No. 8,706. (John Macoun). The only specimens of *T. Vaillantii* in our herbarium are those collected on Prince Edward Island by Mr. Churchill. Prof. Macoun's specimens referred to that species in Pt. XVI of these papers proves to be *T. aquaticum*."

Fernald has since included the North American material named *T. vaillantii* with *T. aquatica*.[5] The author is in agreement with this at least in so far as the Prince Edward Island collection is concerned. These plants, which appear to differ from typical material only in that some of the pedicels are elongated, might possibly be given the rank of form, but certainly not the rank of species. The Fernald and St. John material collected at Tracadie has short pedicels similar to all the other material observed.

[2] Churchill, J. R. Some Plants from Prince Edward Island. Rhodora **4**: 35. 1902.
[3] Ott. Nat. **16**: 216. 1903.
[4] Ott. Nat. **21**: 159. 1907.
[5] Fernald, M. L., Gray's Manual of Botany, ed. 8. 1950.

The third collection of this species was made by John Macoun in 1889, again in British Columbia (damp places, Kamloops, June 26, 1889 (CAN)) and was originally recorded as *Centunculus minimus* (see above). *T. aquatica* was recorded, presumably for the first time for British Columbia, by J. M. Macoun,[4] on the basis of this collection. The only other records from British Columbia are from Alberni Canal, Vancouver Island (see above), New Westminster[6] and Crawford Bay, Kootenay Lake.[7]

Fig. 1. The northern distribution of *Tillaea aquatica* in North America; dots: herbarium specimens; circles: literature records. (Goode's Series of Base Maps No. 111. Copyright 1939 by the University of Chicago).

In 1899 Macoun collected the plant on Sable Island, Nova Scotia—the fourth collection for Canada—(Sable Island, quite common in wet sand, [John] Macoun July 22, 1899 (CAN)), but somehow misnamed it *Montia fontana*. It was not recorded from that area until 1921 when Harold St. John published his paper, Sable Island, with a Catalogue of its Vascular Plants,[8] based on his own collections of 1913 (CAN) as well as the earlier collection of John Macoun. *T. aquatica* was not known from the

[6] Henry, J. K., Flora of Southern British Columbia. 1915.

[7] Eastham, J. W., Supplement to 'Flora of Southern British Columbia.' 1947.

[8] Proc. Boston Soc. Nat. Hist. 36 (1): 76. 1921. Contr. Gray Herb. Harvard Univ., N.S. No. 62.

mainland of Nova Scotia until 1920 when it was collected by Fernald *et al.* (damp sand-flats back of beach, Villagedale, Shelburne Co., *Fernald et al. 21360* (CAN)),[9] or from Cape Breton Island until recorded by Erskine,[10] on the basis of a collection by Smith *et al.* No. *2853* from muddy pond behind beach, Catalogue, Cape Breton Co. A still more recent collection from Cape Breton Island is that of Smith *et al.* from Richmond County (abundant, flat area near pond), Point Michaud, *5135*, August 15, 1951 (DAO).

The first collection for Quebec—and the sixth for Canada—was made in 1905 (Marshes, Beauport near Quebec, John Macoun, August 30, 1905 (CAN)). This was recorded by J. M. Macoun[4] (see above), presumably the first published record of its occurrence in that province. Since then it has been collected numerous times along the St. Lawrence River in the fresh water intertidal zone between Lake St. Peter and Island of Orleans. Elsewhere in Quebec, it is known from the Magdalen Islands in the Gulf of St. Lawrence (wet brackish sand at the margin of a pond northwest of Etang du Nord village, Grindstone Island, *Fernald et al. 7541*, July 24, 1912 (CAN, MT) and wet brackish sand near Hospital Point, *Fernald et al. 7540*, July 18, 1912 (MT)) and Fort George on James Bay (rivage vaseux de la rivière, Fort George, *E. Lepage 12,986*, 5 Sept. 1950 (DAO)). This latter collection is apparently a new record for the James Bay region and Ungava District, Quebec, and is an extension of range of some 550 miles northwest from the St. Lawrence River sites.

Apparently the first record for New Brunswick is that of Blake, based on a collection made in 1913 in brackish tidal mud, French Fort Cove, Miramichi River, Newcastle.[11] This is on the Gulf of St. Lawrence shore of New Brunswick. A second record from New Brunswick is that of C. A. and Una F. Weatherby (forming loose mats in mud over sand, margin of barrier-beach pond, Cheney Island, Grand Manan, No. *7305*, August 3, 1944 (DAO, CAN)). This was reported by Weatherby

[9] FERNALD, M. L., The Gray Herbarium expedition to Nova Scotia, 1920. RHODORA **23**: 150. 265. 1921.

[10] ERSKINE, D., Species newly or rarely reported from Nova Scotia and Cape Breton Island. RHODORA **53**: 268. 1951.

[11] BLAKE, S. F., Notes on the flora of New Brunswick. RHODORA **20**: 105. 1918.

and Adams,[12] from which the following note is quoted: "Not otherwise known from southwestern New Brunswick nor from Maine east of Penobscot; in Nova Scotia known from a single station in Shelburne County." Fassett[13] records specimens from the estuaries of the Kouchibouguac and Kouchibouguacis Rivers but these specimens have not been seen.

The only record from Newfoundland is the collection by Fernald, Long & Dunbar from the sandy and peaty margin of pond back of barrier beach, Argentia, in 1924.[14] Dr. Ernest Rouleau, who is currently working on a Flora of Newfoundland has kindly reported that he has seen this collection, No. *26737*, in the Gray Herbarium.

On August 27, 1948 Lepage collected *T. aquatica* in Alaska (muddy shore of Naknek River, Naknek, Alaska Peninsula, *E. Lepage 24,105* (DAO)). It was again collected in this area by Schofield in 1952 (damp sandy margins of pool, *W. B. Schofield 2770* and damp sandy margin of pond among hills, *2566*, Naknek (DAO)). These collections are an extension of range of some 1400 miles from the nearest known sites in southern British Columbia and the collection from Mackenzie District mentioned below. Its occurrence in Alaska may possibly be more closely related to the Japanese and eastern Siberian distribution reported by Fassett[13] than to the British Columbia or Mackenzie District sites. It is new to the flora of Alaska.

In 1949 the author collected *T. aquatica* at Yellowknife in Mackenzie District and in 1953 revisited the collection site (in 4 inches of water, in thick mat of moss, Yellowknife, *W. J. Cody 3511*, August 16, 1949 (DAO) and in muck sometimes in water up to ½ inch depth of flats of bay by old townsite, Yellowknife, *W. J. Cody & R. L. Gutteridge 7318*, July 14, 1953 (DAO)). Both these collections were from exactly the same locality, but a slight lowering in the level of the water of Yellowknife Bay had considerably altered the habitat. This site is some 1400 miles from the nearest known site to the southeast (Fort George,

[12] Weatherby, C. A. and J. Adams, A list of the vascular plants of Grand Manan, Charlotte County, New Brunswick. Contr. Gray Herb. Harvard Univ. N.S., No. 158. 1945.

[13] Fassett, N. C., The vegetation of the estuaries of northeastern North America. Proc. Boston Soc. Nat. Hist. **39** (3): 73–130. 1928.

[14] Fernald, M. L., Two summers of botanizing in Newfoundland. Rhodora **28**: 86, 210. 1926.

THE HARVARD UNIVERSITY HERBARIUM, built to house the Gray Herbarium, a major portion of the Herbarium and Library, and the Wood Collection of the Arnold Arboretum, the Paleobotanical Collection of the Botanical Museum and the Orchid Herbarium of Oakes Ames, also of the Botanical Museum.

James Bay) and some 900 miles from the sites in southern British Columbia and is the most northerly in North America. It is new to the flora of Mackenzie District and the Northwest Territories.

There is an unsubstantiated record for the French Islands of St. Pierre et Miquelon, off the south coast of Newfoundland. Brother Louis-Arsène in Contribution to the flora of the islands of St. Pierre et Miquelon[15] states "I think I found *Tillaea aquatica* in 1902 near the Grand Barachois, but it was late in the season, the flowers were gone and I did not take specimens, hoping to make a future collection."

Fernald[5] gives the the following North American distribution for *T. aquatica:* Newfoundland to lower St. Lawrence River, Quebec, s. along or near coast to Md.; La. to Tex. and Mex., inland n. to pools and depressions of Minn., Wyo., Utah and Wash. To this should now be added an extension of range into southern British Columbia and the seemingly isolated stands of James Bay, Great Slave Lake and Western Alaska. A map of the northern distribution of *T. aquatica* in North America, is given in figure 1.

Fassett,[13] gives the following extra-North American distribution: Northern Europe, Iceland, Spitzbergen, eastern Siberia, Japan. His map (Pl. 13, fig. 2) shows the worldwide distribution of *T. aquatica* as known to him; the Siberian record, however, seems to have been omitted.

Specimens have been examined in the following herbaria in the preparation of this paper: Botany & Plant Pathology Division, Department of Agriculture, Ottawa (DAO); National Museum of Canada, Ottawa (CAN); Botanical Institute, University of Montreal (MT); and Montreal Botanical Garden.

The Club Herbarium Gets a New Home.—As workmen put the finishing touches on a new Harvard University building (Plate 1202) at the head of Divinity Avenue in Cambridge, the herbarium of the New England Botanical Club was moved into it. Now (April 27) metal workers are busy fastening the steel cases back into position and by the middle of July the

[15] Rhodora **29**: 128. 1927.

specimens should again be available for consultation by the members. Located on the fourth floor, the Club herbarium occupies a rectangular area along the north wall of the building. Large, single-pane windows provide excellent natural light and the aisles between the cases have artificial projection light that reaches to the lowermost compartment of each case. The wall space is occupied by stool-high benches, tables and book-cases. When properly arranged, the Club books will all be shelved for easy access. Formerly, many of them were in storage or in a cabinet where they could not be easily consulted.

The new building has been carefully designed to provide the maximum in the safety and care of herbarium specimens and books. Fire-proofing has been carried out to the fullest. The building is air-conditioned and has humidity control. The violent fluctuations in humidity, especially, have previously been a source of worry in connection with the proper preservation of books and specimens. A most important feature of the building is its air-cleaning system. All air coming into the building and all air circulated within it is passed over cleaning devices that take out dirt and soot particles. This should permit an order of cleanliness for books and specimens here-tofore unobtainable.

The preparation, mounting, sorting, fumigation and temporary storage of specimens will be carried out on the ground floor where special facilities for these activities are provided. This floor, though slightly below ground level, has full-sized windows and is admirably suited to its purposes.

The Club herbarium has been closely associated with the Gray Herbarium for many years and this relationship will continue. The new building was erected to house the Gray Herbarium, a major portion of the Herbarium and Library, and the Wood Collection of the Arnold Arboretum, the Paleobotanical Collection of the Botanical Museum and the Orchid Herbarium of Oakes Ames. Instruction in Dendrology, Paleobotany and Taxonomy will also be carried out in the building, which is located at 22 Divinity Avenue.—R. C. Rollins.

Some New Names in South American Gentiana.—During the course of his careful work on the South American species of *Gentiana*, the late Dr. Ernst Gilg inadvertently gave names to three species which are later homonyms. Accordingly, it becomes necessary to rename these species.

Gentiana alticola R. C. Foster, nom. nov. *G. lancifolia* Gilg in Engler, Bot. Jahrb. **22:** 326 (1896), not *G. lancifolia* Rafn, Danm. og Holst. Fl. **2:** 217 (1800).

G. neomandonii R. C. Foster, nom. nov. *G. Mandonii* Gilg in Engler, Bot. Jahrb. **54,** Beibl. **118:** 37 (1916), not *G. Mandoni* Rusby in Mem. Torr. Bot. Cl. **6:** 80 (1896).

G. sancti-matthaei R. C. Foster, nom. nov. *G. praticola* Gilg in Engler, Bot. Jahrb. **54:** Beibl. **118:** 46 (1916), not *G. praticola* Franch. in Bull. Soc. Bot. France, **43:** 493 (1896).—Robert C. Foster. gray herbarium, harvard university.

Recently Introduced Plants in Southern Ontario.—Two new arrivals have been brought to my attention recently in plant collections by S. L. Thompson of Toronto, and M. Landon of Simcoe, Ontario.

Nardus stricta L.—This grass, introduced from Europe, was collected by S. L. Thompson in a sandy meadow near Huntsville in the Muskoka District on July 1, 1953. This species has been found locally in Nova Scotia, Quebec and Michigan.

Xanthisma texanum DC.—An introduction from Texas, found by M. Landon growing along a sandy roadside in Norfolk County. It was collected in August of 1937, on lot 6, Conc. XII, in Townsend Township.

Specimens have been placed in the Herbarium of the Department of Botany at the University of Toronto.

J. K. Shields, department of botany, university of toronto.

A Popular Flora of Central Colorado[1]—The identification of the flowering plants of the Rocky Mountain region has always been difficult for amateurs and none too easy for professional botanists. Of the two

[1] Weber, William A. Handbook of plants of the Colorado Front Range. Keys for the identification of the ferns, conifers, and flowering plants of the central Rocky Mountains from Pikes Peak to Rocky Mountain National Park and from the Plains to the Continental Divide. vi, 232 p. 78 fig. (mostly in glossary, and incl.map). 22 cm. University of Colorado Press, Boulder, 1953. ($5.00)

standard manuals of the last half century, that of Coulter and Nelson (1909) is out of print and long out of date, and that of Rydberg (1917 [1918], 2d ed. 1922 [1923]), in addition to being out of print and only very rarely obtainable at a high price (now about $30), has disadvantages of its own; and neither work is adapted for use by amateurs without considerable acquaintance with botanical terminology. None of the more popular works on the flowers of the region is a complete guide to identification, and most attempt to cover too great an area to be used very satisfactorily in any single part of it. Among those of more restricted range are popular floras of Rocky Mountain Park in Colorado, Yellowstone Park in Wyoming, and Glacier Park in Montana, all put out by the National Park Service, each illustrating a hundred or more plants but none attempting to key all the species found in its region.

The most comprehensive of these popular works is M. W. Pesman's *Meet the Natives*, now in its fifth edition (1952), which relates primarily to Colorado and includes very brief descriptions of over 700 species grouped by life zone and color, about 200 of which are figured. A more complete work for its area is C. L. Porter's *A Spring Flora of the Laramie Area* (rev. ed., 1949), written primarily for college students and consisting of keys employing a minimum of technical terms. A. O. Garrett's *Spring Flora of the Wasatch Region* (5th ed. 1936; out of print) is intended for use by amateur botanists; it includes descriptions as well as keys.

Prof. Weber's work covers completely an area about 135 miles long from north to south and 50 to 75 miles wide, from Ft. Collins south to the latitude of Pikes Peak, with Denver about in the center of its eastern margin, and can be used to advantage in much of mountainous Colorado west and south of this. It includes about 1300 species, almost half the total flora of the state, and embraces an altitudinal range from 5000 to over 14000 feet, from the western edge of the Great Plains to the Continental Divide. The prefatory matter deals briefly with such subjects as plant zones, use of keys, parts of the flower, collecting equipment, and reference books. The bulk of the book consists of dichotomous, non-indented keys to families, genera, and species. In many cases, when the species are not too numerous, generic keys as such are omitted and all the species of a family are included in a single key. The key characters appear in general to be well chosen for constancy and ease of observation, and the technical terms that must necessarily be used in a work that aims to be complete are defined in simple terms in the glossary, where many of them are illustrated. The habitats of all species are given in the keys and constitute an additional aid in identification. Altogether the work seems well adapted to serve the needs of amateur and professional alike in the identification of the vascular plants of this much visited region.
—S. F. Blake, agricultural research service, beltsville, md.

Volume 56, no. 664, containing pages 65–80 was issued 3 May, 1954.

RATES FOR SPECIAL NUMBERS OF RHODORA

Many of the single numbers can be supplied only at special prices, as follows:

Vol. 12, no. 134: 50c
no. 138: 45c
Vol. 13, no. 151: 70c
Vol. 14, no. 163: 60c
Vol. 15, no. 171: 45c
Vol. 16, no. 182: 45c
Vol. 17, no. 193: 45c
Vol. 18, no. 205: 50c
Vol. 19, no. 224: 45c
no. 225: 50c
Vol. 21, no. 241: 45c
no. 243: 45c
Vol. 23, no. 265: 45c
no. 268: 45c
no. 269: 45c
no. 270: 45c
no. 271: 45c
no. 274: 45c
no. 275: 45c
Vol. 24, no. 279: 45c
no. 283: 45c
Vol. 25, no. 296: 45c
Vol. 26, no. 304: 50c
no. 305: 60c
no. 306: 45c
Vol. 28, no. 331: 45c
Vol. 29, no. 346: 45c
Vol. 30, no. 351: 50c
no. 356: 45c
no. 357: 45c
Vol. 31, no. 364: 50c
no. 369: 50c
no. 370: 50c
Vol. 32, no. 374: $1
no. 376: 45c
no. 382: 50c
no. 383: 45c
Vol. 33, no. 386: 60c
no. 388: 45c
no. 389: 45c
no. 391: $1
Vol. 34, no. 403: 45c
no. 407: 45c
Vol. 35, no. 410: 50c
no. 418: 50c
no. 419: 50c
Vol. 36, no. 425: 55c
no. 426: 50c
no. 429: 70c
no. 430: 55c
Vol. 37, no. 433: $1
no. 435: 60c
no. 436: 70c
no. 437: 50c
no. 439: 60c
no. 440: 60c
no. 441: 50c
no. 443: 55c
Vol. 37, no. 444: 55c
Vol. 38, no. 445: 50c
no. 448: 70c
no. 450: 70c
no. 455: 55c
no. 456: 50c
Vol. 39, no. 458: 50c
no. 463: 55c
no. 464: 75c
no. 466: 55c
Vol. 40, no. 471: $1
no. 476: 50c
no. 477: 55c
no. 478: 60c
no. 479: 55c
Vol. 41, no. 482: 55c
no. 486: 55c
no. 487: $1
no. 488: 60c
no. 489: 95c
no. 490: 50c
no. 491: 50c
Vol. 42, no. 499: 50c
no. 500: $1
no. 502: 50c
no. 503: 70c
Vol. 43, no. 506: $1
no. 509: $1
no. 512: 50c
no. 513: 50c
no. 514: 70c
no. 515: 75c
Vol. 44, no. 520: 70c
no. 525: 75c
no. 526: 75c
no. 527: 70c
no. 528: 60c
Vol. 45, no. 529: $1
no. 531: 60c
no. 532: 55c
no. 533: 55c
no. 534: 75c
no. 535: 70c
no. 538: 85c
no. 539: 75c
no. 540: 75c
Vol. 46, no. 542: 50c
no. 544: 60c
no. 545: 55c
no. 546: 55c
no. 547: 50c
no. 548: 45c
no. 550: 55c
no. 551: 55c
no. 552: 50c
Vol. 47, no. 553: 75c
no. 554: 50c
no. 555: 60c
no. 556: 75c
Vol. 47, no. 557: 75c
no. 558: 50c
no. 559: 75c
no. 560: 60c
no. 562: 85c
no. 563: 85c
Vol. 48, no. 566: 60c
no. 567: 50c
no. 568: 60c
no. 569: 50c
no. 570: 50c
no. 571: 60c
no. 572: 50c
no. 573: 70c
no. 574: 70c
no. 575: 70c
no. 576: 50c
Vol. 49, no. 577: 50c
no. 578: 60c
no. 580: 60c
no. 581: 70c
no. 582: 80c
no. 583: 75c
no. 587: 50c
no. 588: 50c
Vol. 50, no. 589: 45c
no. 590: 60c
no. 591: 40c
no. 592: 60c
no. 593: 60c
no. 594: 40c
no. 595: 75c
no. 596: 85c
no. 597: 55c
no. 598: 40c
no. 599: 60c
no. 600: 65c
Vol. 51, no. 603: 80c
no. 604: 85c
no. 609: 75c
no. 610: 70c
no. 611: 70c
no. 612: 70c
Vol. 52, no. 616: 50c
no. 617: 70c
no. 618: 60c
no. 623: 50c
no. 624: 60c
Vol. 53, no. 625: 60c
no. 626: 60c
no. 627: 50c
no. 630: 50c
no. 635: 50c
no. 636: 60c
Vol. 54, no. 637: 50c
no. 638: 50c
no. 639: 50c
no. 640: 65c
no. 647: 60c
no. 648: 50c

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY

131. Rollins, Reed C. I. Studies in the Genus Hedysarum in North America. Fernald, M. L. II. Some Spermatophytes of Eastern North America. Rollins, Reed C. III. On two weedy Crucifers. With 29 plates. (Reprinted from Rhodora, XLII. 86 pp. 1940.) .85

132. Scamman, Edith A list of Plants from Interior Alaska. (Reprinted from Rhodora, XLII, 309–349 pp. 1940.) .40

133. Fernald, M. L. A Century of Additions to the Flora of Virginia. With 24 plates. (Reprinted from Rhodora, XLII. 161 pp. 1940.) 1.00

134. Tryon, Jr., R. M. Revision of the Genus Pteridium. With 4 plates. (Reprinted from Rhodora, XLIII. 62 pp. 1941.) .65

135. Foster, Robert C. I. Studies in the Iridaceae—II. Schubert, Bernice G. II. Desmodium: Preliminary Studies—II. Hodge, W. H. III. The Genus Charianthus. IV. The Type Species of Heliconia. With 7 plates. (Published by the Gray Herbarium, 1–141 pp. 1941.) 1.25

136. Wheeler, Louis C. Euphorbia Subgenus Chamaesyce in Canada and the United States Exclusive of Southern Florida. With 15 plates. (Reprinted from Rhodora, XLIII. 160 pp. 1941.) 1.25

137. Smith, L. B. Studies in the Bromeliaceae.—XII. With 3 plates. (Reprinted from Lilloa, VI. 381–417 pp. 1941.) .50

138. Rollins, Reed C. Monographic Study of Arabis in Western North America. With 7 illustrations. (Reprinted from Rhodora, XLIII. 158 pp. 1941.) 1.00

139. Fernald, M. L. Another Century of Additions to the Flora of Virginia. With 26 plates. (Reprinted from Rhodora, XLIII. 164 pp. 1941.) 1.25

140. Fernald, M. L. Incidents of Field-work with J. Franklin Collins. With 13 plates. (Reprinted from Rhodora, XLIV. 98–152 pp. 1942.) .65

141. Weatherby, C. A. A List of Type Specimens in Elliott's Herbarium. (Reprinted from Rhodora, XLIV. 249–264 pp. 1942.) .25

142. Howard, Richard A. Studies of the Icacinaceae IV and V. With 6 plates. (Published by the Gray Herbarium, 1–92 pp. 1942.) .65

143. Tryon, Jr., R. M. A Revision of the Genus Doryopteris. With 8 illustrations. (Published by the Gray Herbarium, 1–80 pp. 1942.) .60

144. Fernald, M. L. Critical Notes on Carex. With 7 plates. (Reprinted from Rhodora, XLIV. 281–334. 1942.) .60

145. Fernald, M. L. The Seventh Century of Additions to the Flora of Virginia. With 28 plates. (Reprinted from Rhodora, XLIV. 124 pp. 1942.) 1.00

146. Moore, Jr., H. Emery. A Revision of the Genus Geranium in Mexico and Central America. With 5 plates. (Published by the Gray Herbarium, 1–108 pp. 1943.) .65

147. Ogden, E. C. The Broad-leaved Species of Potamogeton of North America North of Mexico. With 3 plates. (Reprinted from Rhodora, XLV. 138 pp. 1943.) 1.00

148. Fernald, M. L. I. Five common Rhizomatous Species of Muhlenbergia. II. Notes on Danthonia. III. Erianthus brevibarbis and other Species. IV. Why not Andropogon Gerardi'? V. Studies in North American Species of Scirpus. VI. The Identity of Scleria setacea of Poiret. VII. What is Angelica triquinata'? VIII. Notes on Hieracium. With 21 plates. (Reprinted from Rhodora, XLV. 72 pp. 1943.) .85

149. Fernald, M. L. Virginian Botanizing under Restrictions. With 37 plates. (Reprinted from Rhodora, XLV. 120 pp. 1943.) 1.00

*Out of print.